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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re The Application Of

Alan R. Neuhauser, *et al.*

Serial No.: 09/318,045

Filed: May 25, 1999

For: Decoding Of Information In Audio Signals

Examiner: Martin Lerner

Group Art Unit: 2654

Appeal Brief Under 37 C.F.R. §1.192

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Having filed a Notice of Appeal on July 29, 2003 from the final rejection mailed on May 16, 2003, of currently pending claims 1-18, and having filed a Second Petition for Extension of Time to file the Appeal Brief until December 29, 2003, Appellants submit their Appeal Brief for the above-captioned application pursuant to 37 C.F.R. §1.192 in triplicate as follows.

Certificate of Mailing: I hereby certify that this correspondence is today being deposited with the U.S. Postal Service as first class mail in an envelope addressed to: Mail Stop Appeal Brief – Patents; Commissioner for Patents; P.O. Box 1450; Alexandria, VA 22313-1450.

December 29, 2003

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Real Party in Interest

The real party in interest is Arbitron, Inc., residing at 9705 Patuxent Woods Drive, Columbia, MD 21046-1572.

Related Appeals and Interferences

There are no related appeals or interferences.

Status Of Claims

Claims 1-18 are currently pending, stand finally rejected, and are the subject of the instant Appeal. A copy of each of these claims is attached hereto as Exhibit A.

Status Of Amendments

Appellant has filed no Amendments since the mailing of the Final Rejection on May 16, 2003.

Summary Of Invention

With respect to claims 1, 13 and 16 Appellants disclose system 90 and a method (FIG. 6 and specification page 18, third paragraph) for decoding a predetermined message symbol of a plurality of message symbols embedded in an audio signal. System 90 (FIG. 6 and specification page 18, fourth paragraph) comprises a means for receiving an audio signal 93 (FIG. 6 and specification page 18, last paragraph) in which a plurality of message symbols have been incorporated so that the message symbols are inaudible when the audio signal is reproduced audibly 18, 20 (FIG. 1 and specification page 7, third paragraph, as well as page 9, last paragraph). The plurality of message symbols are contained within a predetermined message as a plurality of code symbols (FIGS. 2, 3A-C and specification pages 11-14).

The predetermined message symbol to be detected is encoded by first and second code symbols (FIG. 4 and specification page 13, last paragraph) incorporated in the audio signal. Additionally, the first and second code symbols are displaced in time

in the audio signal with at least one code symbol representing a different one of the message symbols being incorporated in the audio signal and positioned in time between the first and second code symbols (FIGS. 3B-C and specification page 12-14).

The predetermined message symbol is detected by the combination of (1) accumulating a first signal value of the first code symbol (2) accumulating a second signal value of the second code symbol, and (3) examining the accumulated first and second signal values to detect the predetermined message symbol (see FIGS. 7 and 8 and specification pages 19-25).

References Cited And Applied

U.S. Patent No. 5,450,490 to Jensen et al.

U.S. Patent No. 5,960,048 to Haartsen.

Grounds Of Rejection

Claims 1-18 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Jensen et al. in view of Haartsen.

Issues Presented For Review

1. Whether Jensen et al. and Haartsen suggest or teach all the claim limitations of the present invention; and

2. Whether Haartsen provides any motivation to modify Jensen et al. to arrive at the claimed invention.

Grouping of Claims

The claims do not stand or fall together. The invention is claimed from several perspectives, each defining the invention in materially different terms.

Each of the dependent claims adds specific additional elements to the novel combination of the independent claims. As such, all claims must be considered

because it is improper to fail to consider any limitation in the claims. In re Geerdes, 491 F.2d 1260, 1262, 180 U.S.P.Q. 789, the 791 (CCPA 1974) ("every limitation in the claim must be given effect rather than considering one in isolation from the others").

Argument

The Examiner bears the burden of proving (1) that Jensen et al. and Haartsen suggest or teach all the claim limitations of the present invention; and (2) that Haartsen provides a motivation to modify Jensen et al. to arrive at the claimed invention. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). See MPEP § 2143 - § 2143.03. However, a careful review of the references, as well as the references in combination, will demonstrate that the Examiner has failed to prove either point (1) or point (2), and thus has failed to establish a prima facie case of obviousness.

The Collective Teachings of Jensen et al. and Haartsen Fail to Teach or Suggest all the Claim Limitations

In the present invention as recited in independent claims 1, 13 and 16 a message symbol to be detected (see FIG. 2) is represented by *two code symbols* (see FIG. 4) separated in time by another code symbol representing a *different* message symbol (see FIGS. 3B and C). Jensen et al. do not disclose or even suggest this feature. Viewed overall, the predetermined message symbol to be detected by the claimed invention is one of a plurality of message symbols embedded in the audio signal. At a lower level of the claimed invention (not disclosed by Jensen et al.) one of the predetermined message symbols is represented by "first and second code symbols" that are displaced in time in the audio signal with another code symbol representing a *different message symbol* positioned in time between them. The claimed invention serves to decode such a message symbol by receiving the first and second code symbols that are displaced in time in the audio signal by a code symbol representing a different message symbol, accumulating a first signal value of the first code signal, accumulating a second signal value of the second code symbol, and examining both of the first and second values to detect the predetermined message symbol.

In contrast, Jensen, et al. disclose how to encode a message symbol represented by various frequency components within a single time interval as well as techniques for decoding such a message symbol. However, Jensen et al. do not teach or suggest representing a message symbol by two code symbols separated in time by a code symbol representing a different message symbol, and do not teach or suggest how to decode such a message symbol. See Col. 10, lines 40-52; Col. 12, lines 28-55; Col. 16, lines 13-19, and Col. 19, lines 32-34. Therefore, the teachings of Jensen et al. do not disclose how to decode such a message symbol by receiving the two or more code symbols that represent it, accumulating separate values for each code symbol and examining the two values to detect the message symbol as claimed by the present invention and the Examiner concedes this point on page 4 of the Final Rejection.

Consequently, the Examiner seeks to supply the teachings missing from Jensen et al. by citing Haartsen and asserting that Haartsen discloses a "method... where time division message symbols are accumulated and examined." It is respectfully submitted that this characterization of Haartsen is incorrect.

While it is true that Haartsen makes a passing reference to time multiplex systems (TDMA), [see Col. 1, lines 15-23], the synchronization technique described by Haartsen is not a time multiplex technique. As defined in the Federal Standard 1037C, Telecommunications: Glossary of Telecommunications Terms, a copy of which is attached hereto as Exhibit B, time-division multiple access (TDMA) is defined as a communications technique that uses a common channel (multipoint or broadcast) for communications among multiple users by allocating unique time slots to different users, which is not the subject of Haartsen's disclosure. The synchronization technique of Haartsen teaches how the communication channel between the transmitter and receiver can be synchronized by detecting a single digital sequence by dividing it up into segments and then correlating it segment-wise at the receiver with a locally generated copy of the sequence. Haartsen then examines the correlation values of the signature segments, and if they exceed a certain threshold value, a single synch time pulse signal is generated. See the Abstract. Accordingly, the digital sequence represents only one message symbol or piece of information.

Conventionally, the performance of such a synchronization system was directly dependent on the length of the signature because the longer the signature, the more accurate the correlation. However, there are practical difficulties in using a long signature in conventional systems such as excessive power consumption, the degree of complexity of implementation, excessive memory usage and the inability to change the signature length.

As a result, Haartsen proposed to detect the single digital sequence by dividing it up into an allocated plurality of segments and then sequentially correlating the various segments. See Col. 2, line 65 to Col. 3, line 27. Therefore, the techniques taught by Haartsen solve the problems associated with the use of long signatures to synchronize transmitters and receivers in communications systems that existed in the prior art and are not directed to the problem of producing a coding and decoding system for a time division multiplexed or TDMA system.

Moreover, since Haartsen's purpose is to detect a single, continuous digital sequence to output a single sync time pulse, it does not disclose elements for receiving, accumulating and examining a message symbol that is composed of at least two code symbols that are displaced in time in the audio signal by a code symbol representing a different message symbol. Moreover, Haartsen does not teach or suggest detecting such a message symbol by accumulating a first value of the first code symbol, accumulating a second value of the second code symbol, which is separate from the first code symbol, and examining both the first value and the second value to detect the message symbol.

TDMA Techniques Do Not Suggest The Claimed Invention

Nor would any TDMA technique teach or suggest the above elements omitted by Haartsen because all of these techniques simply allocate respective time slots among multiple users in a given communication channel, which does not suggest encoding a message symbol as code symbols in two or more such time slots. In reality, the need to resynchronize the receiver to receive the data of a time slot allocated to a respective user leads one of ordinary skill in the art to avoid distributing a message symbol among

two or more time slots.

Even if the teachings of Jensen et al. are modified as suggested by the Examiner, the result would be a system transmitting a series of message symbols (as in Jensen et al.) and detecting each message symbol by segmenting it to separately detect each segment (as in Haartsen). This would not lead one of ordinary skill in the art to detect a message symbol by receiving, accumulating and examining at least two code symbols that are displaced in time in the audio signal by a code symbol representing a different message symbol as is claimed by the present invention.

Haartsen Provides No Motivation to Modify Jensen et al. to Arrive at the Claimed Invention

As noted above, Haartsen detects a single message symbol represented by an uninterrupted digital sequence through correlation with a copy of the sequence. In particular, Haartsen proposes the use of a relatively short correlator in place of a single long correlator to split up the correlation operation [see the Summary of the Invention for Haartsen and page 5, first paragraph of the final rejection]. In fact, Haartsen adds nothing to the teachings of Jensen et al., since like Haartsen, Jensen et al. only detect one continuous code symbol at a time. See Col. 26, lines 25 to 34. The Examiner has recognized this in his Final Rejection; see the last two lines on page 3 and the first three lines on page 4.

Consequently, Haartsen does not teach one of ordinary skill in the art how to detect a message symbol encoded as two code symbols separated in time by another code symbol representing a different message symbol. In particular, Haartsen does not teach or suggest accumulating two separate values each for a respective one of the two code symbols. Nor does Haartsen teach or suggest examining both of such values to detect the message symbol represented by the two code symbols.

Haartsen thus fails to provide any motivation to modify Jensen et al. to arrive at the claimed invention.

Therefore, the Examiner has failed to establish the basic criteria of a prima facie case of obviousness.

Conclusion

Accordingly, reconsideration and allowance of all of the claims of the present application is respectfully solicited.

Respectfully submitted,

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EXHIBIT A - Pending Claims

1. A system for decoding a predetermined message symbol of a plurality of message symbols embedded in an audio signal, comprising:

means for receiving an audio signal in which a plurality of message symbols have been incorporated so that the message symbols are inaudible when the audio signal is reproduced audibly, the plurality of message symbols being contained within a predetermined message as a plurality of code symbols, the predetermined message symbol being represented by first and second code symbols incorporated in and displaced in time in the audio signal with at least one code symbol representing a different one of the message symbols being incorporated in the audio signal and positioned in time between the first and second code symbols;

means for accumulating a first signal value of the first code symbol representing the predetermined message symbol and a second signal value of the second code symbol representing the predetermined message symbol; and

means for examining the accumulated first and second signal values to detect the predetermined message symbol represented by the first and second code symbols.

2. The system of claim 1, wherein the accumulating means is operative to produce a third signal value derived from the first and second signal values and the examining means is operative to detect the predetermined message symbol based on the third signal value.

3. The system of claim 2, wherein the accumulating means is operative to produce the third signal value by linearly combining the first and second signal values.

4. The system of claim 2, wherein the accumulating means is operative to produce the third signal value as a non-linear function of the first and second signal values.

5. The system of claim 2, wherein the first and second code symbols each comprise a predetermined number of frequency components, and further comprising

means for producing first and second sets of component values, each set corresponding to a respective one of the first and second code symbols and each component value of each set representing a characteristic of a respective frequency component of the corresponding symbol, and means for producing the first signal value based on the first set of component values and producing the second signal value based on the second set of component values.

6. The system of claim 2, wherein the plurality of message symbols is represented by plural sets of first and second code symbols, each set representing a respective one of the plurality of message symbols, the plural sets of first and second code symbols being arranged as a message having a predetermined sequence including at least one marker symbol and at least one data symbol, and wherein the accumulating means is operative to accumulate sets of first and second signal values, each signal value set corresponding to a respective one of the sets of first and second code symbols and including a first signal value representing the first code symbol of the respective code symbol set and a second signal value representing the second code symbol thereof and the examining means is operative to detect the message by detecting the presence of the marker symbol based on its signal value set and to detect at least one data symbol based on the detected presence of the marker symbol and the corresponding signal value set of the at least one data symbol.

7. The system of claim 1, wherein the accumulating means is operative to store the first and second signal values, and the examining means is operative to detect the predetermined message symbol by examining both of the first and second signal values.

8. The system of claim 7, wherein the accumulating means is operative to produce the first and second signal values based on multiple other signal values.

9. The system of claim 8, wherein the first and second signal values are produced from respective sets of time displaced signal values, each of the time displace signal values representing a value of a respective one of the first and second code symbols during a corresponding time period thereof.

10. The system of claim 8, wherein the first and second code symbols each comprise a predetermined number of frequency components, and further comprising means for producing first and second sets of component values, each set corresponding to a respective one of the first and second code symbols and each component value of each set representing a characteristic of a respective frequency component of the corresponding symbol, and means for producing the first signal value based on the first set of component values and producing the second signal value based on the second set of component values.

11. The system of claim 1, wherein the receiving means comprises an acoustic transducer for transducing an acoustic audio signal to an electrical signal, the acoustic audio signal having a plurality of code symbols representing a plurality of message symbols comprising source data for the acoustic audio signal, and further comprising a memory for storing indications of detected message symbols.

12. The system of claim 11, further comprising a housing for the system adapted to be carried on the person of an audience member and means for transmitting the stored data for use in producing audience estimates.

13. A method for decoding a predetermined message symbol of a plurality of message symbols incorporated in an audio signal, comprising:

receiving an audio signal in which a plurality of message symbols have been incorporated so that the message symbols are inaudible when the audio signal is

reproduced audibly, the plurality of message symbols being contained within a predetermined message as a plurality of code symbols, the predetermined message symbol being represented by first and second code symbols incorporated in and displaced in time in the audio signal with at least one code symbol representing a different one of the message symbols being incorporated in the audio signal and positioned in time between the first and second code symbols;

accumulating a first signal value of the first code symbol representing the predetermined message symbol and a second signal value of the second code symbol representing the predetermined message symbol; and

examining the accumulated first and second signal values to detect the predetermined message symbol.

14. The method of claim 13, further comprising receiving the first and second code symbols by transducing an acoustic audio signal to an electrical signal, the acoustic audio signal having a plurality of message symbols comprising source data for the acoustic audio signal, and storing data representing indications of detected message symbols.

15. The method of claim 14, further comprising transmitting the stored data for use in producing audience estimates.

16. A system for decoding a predetermined message symbol of a plurality of message symbols incorporated in an audio signal, comprising:

an input device for an audio signal in which a plurality of message symbols have been incorporated so that the message symbols are inaudible when the audio signal is reproduced audibly, the plurality of message symbols being contained within a

predetermined message as a plurality of code symbols, the predetermined message symbol being represented by first and second code symbols incorporated in and displaced in time in the audio signal with at least one code symbol representing a different one of the message symbols being incorporated in the audio signal and positioned in time between the first and second code symbols; and

a digital processor in communication with the input device to receive the audio signal therefrom, the digital processor being programmed to accumulate a first signal value representing the first code symbol and a second signal value representing the second code symbol, the digital processor being further programmed to examine the accumulated first and second signal values to detect the predetermined message symbol.

17. The system of claim 16, wherein the input device comprises an acoustic transducer for transducing an acoustic signal to an electrical signal, the acoustic audio signal having a plurality of code symbols representing a plurality of message symbols comprising source data for the acoustic audio signal, the digital processor having a memory for storing data representing indications of detected message symbols.

18. The system of claim 17, further comprising a housing for the system adapted to be carried on the person of an audience member and means for transmitting the stored data for use in producing audience estimates.

time-division multiple access (TDMA)

time-division multiple access (TDMA): A communications technique that uses a common channel (multipoint or broadcast) for communications among multiple users by allocating unique time slots to different users. (188) *Note:* TDMA is used extensively in satellite systems, local area networks, physical security systems, and combat-net radio systems.

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